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ORACBA News

United States Department of Agriculture Office of Risk Assessment and Cost-Benefit Analysis

Consistency, Transparency, and "Acceptable Level of Risk" for Plant Pest Risk Management in International Trade

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Compliance with the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) depends in part on the ability of each Member country to render import decisions in a way that demonstrates a consistently applied concept of an "appropriate level of protection" (ALP). In late 1997, the North American Plant Protection Organization (NAPPO) charged each Member country with offering an interpretation of obligations regarding the ALP concept. In response to this charge, the USDA Animal and Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ) prepared a discussion paper elaborating a position on ALP relevant to phytosanitary issues. The APHIS paper was delivered to NAPPO in April 1998. This paper, however, in no way represented the definitive APHIS statement or policy on ALP as it relates to the SPS Agreement. Indeed, it represents just one of the *first* statements that the NAPPO Members will consider in what is shaping up to be a protracted debate about a very complex and contentious issue. Consensus on the implications and practical application of ALP is still evolving within APHIS and is subject to modification as the discussion expands among other government agencies, stakeholders in agricultural trade, and our NAPPO trading partners. In the interest of widening the discussion on the meaning and implementation of a concept of ALP in relation to phytosanitary issues within the statutory jurisdiction of APHIS, the main ideas in the paper to NAPPO are presented here.

What the SPS Agreement says about the ALP.[1] The SPS Agreement recognizes the right of each Member to set its ALP; however, the Agreement defines ALP tautologically (Annex A.5) and does not provide instructions on how to set it. A note in Annex A.5 recognizes that many Members refer to the concept as "acceptable level of risk." Because the term "risk" has technical meaning, and the SPS Agreement describes how risks can be assessed (Article 5.2-5.3, Annex A.4), the term "acceptable level of risk" (ALR) was preferred to "appropriate level of protection" in the discussion paper presented to NAPPO and is used preferentially in this article as well. The SPS Agreement requires each Member country to meet several obligations with respect to ALR. Article 5.5 obligates Members to "achieving consistency in the application of the concept of [ALR]." The SPS Agreement states that sanitary and phytosanitary measures (SPS measures) are used "to achieve" an ALR (e.g., Article 5.6) and that SPS measures must be based on a risk assessment that takes into consideration certain relevant scientific and economic factors (Article 5.1-5.3). Members must provide "answers to all reasonable questions from interested Members as well as [provide] relevant documents" regarding phytosanitary regulations it has adopted or proposed, control and inspection procedures, production

CONTENTS

and quarantine treatment, pest tolerance, risk assessment procedures, factors taken into consideration, as well as the determination of the ALR (Article 7, Annex B).

Thus, although the SPS Agreement allows each Member the right to set its own ALR, the Agreement does not provide instructions on how to set it. Although SPS measures applied to achieve ALR must be based on a risk assessment, the ALR itself does not. Each Member must be consistent in applying its own concept of ALR to avoid arbitrary or unjustifiable distinctions in ALR in dif ferent situations, if such distinctions result in discrimination or a disguised restriction on international trade.

PPQ's Plant Pest Risk Assessment and ALR . Plant quarantine responsibilities reside with the APHIS-PPQ. PPQ's starting point for risk management is a pest risk assessment (PRA), which identifies the likelihood and consequences (economic and biological) of an adverse plant pest event that could be associated with the entry of a particular import. The PRA also provides a basis for estimating the degree to which a risk can be reduced successfully by available management strategies and for comparing risks and management options. These characteristics of the PRA are consistent with the SPS Agreement description of risk assessment. Furthermore, PPQ publishes proposed and final rules in the Federal Register and notifies the WTO of any measure that may affect another country's trade. New proposed regulatory changes published in the Federal Register specify the risks and the requirements that will be imposed to mitigate the risks. Revision of a proposed action following public comment is an integral part of this process. Thus, the process for assessing risk as a prelude to risk management is a consistent, transparent contribution to the U.S. ef forts to meet its obligations under the SPS Agreement.

Although risk assessments can be a major source of information for risk managers, risk assessment alone does not provide a mechanism for determining or communicating the "acceptable" level of risk. Most of the PRAs conducted by PPQ are "qualitiative" risk assessments that categorize risks as high, medium, or low . Usually, an import judged to be a high risk is subjected to risk mitigation measures, implying that risks categorized as high are unacceptable. Occasionally , PPQ conducts a quantitative risk assessment, in which risk can be expressed in terms of quantified probabilities. Quantitative approaches, including "bright-line" graphical representations of the level of risk, have value for considering risk management thresholds. However , the complexity in quantifying diverse and often non-economic consequences of accidental pest introductions (as well as the possibility of manipulating calculations of quantitative risk estimates in order to influence a management decision) can create problems in setting risk management thresholds or defending them.

In practice, PPQ risk assessment and management processes do not identify an explicit quantitative ALR. In most cases, the goal set by PPQ for phytosanitary measures, which is what the SPS Agreement calls ALR, is simply the absence of the pest in a sample of the imported product. The size of the sample and the rigor with which it is analyzed imply the seriousness of the pest risk. In this sense, ALR is not a static threshold. It can be modified on the basis of updated information about the pest(s), pathway(s) of entry, and potential consequences of pest entry, changing resources available for sampling and inspection, and perhaps other factors. A quantitatively defined ALR applied with great consistency would fulfill an intent of the SPS Agreement but would not accommodate such changing, yet essential, information that underlies PPQ's judgment of the ef fort that should be expended to look for particular pests and whether a pest risk must be mitigated -- in other words, whether a risk is *unacceptable*.

One possible alternative to transparency and *quantitative* consistency in the application of ALR might involve transparency and consistency in the application of a *process* for determining an ALR that is flexible to new pests and pathways, as well as new information about familiar ones. Such a process would need to extend the consistency and transparency that characterize a PRA to the subsequent judgment, communication, and application of a flexible concept of ALR. SPS measures are applied to achieve ALR, so an importing Member must be able to communicate clearly to the exporter the risk that is unacceptable, why, and the mitigation goal that must be achieved. The pest and mitigation goal are communicated easily: the pest of regulatory concern must be absent from a risk-based sample of a shipment. What remains to be established is a process to determine the specific basis, among all possible consequences, upon which a particular risk has been deemed unacceptable, and how that decision is consistent with previous decisions about the acceptability of risks.

To meet the obligations in the SPS Agreement for consistency and transparency in ALR decision making, continued application of this flexible concept of ALR, and transparent documentation of decisions regarding ALR and phytosanitary measures, we propose using a risk assessment as the major source of information for decision makers in answering a standardized set of questions. These questions, which are in large part embodied already in PPQ's PRA framework, reflect domestic economic and plant protection interests and allow decision makers to be explicit in identifying specific components of pest risk associated with the import that present a level of risk considered acceptable or unacceptable to the United States. The process of answering specific questions and deriving the answers from a completed risk assessment (and possibly other sources, e.g., public or expert comment) should clarify the various dimensions of risk posed to different sectors of the economy and society. If the decision maker determines that none of the answers to the questions raises an issue of potentially unacceptable risk, then the import could be permitted with no restrictions. If one or more of the answers raises an issue of potentially unacceptable risk, then the goal to be met by the exporting Member's SPS measures must be specified. The exporting Member would bear the burden of proof that an SPS measure it proposes to implement will meet the goal. By breaking the complexity of pest risk likelihood and consequences down into specific issues, decision makers may be able to focus debate among themselves and with stakeholders or trading partners on specific aspects of consequences that are unacceptable.

Proposed Questions for Standardizing the Classification of Risks as Acceptable or Unacceptable

The first question ensures that **risk assessment information** has been assembled to guide the ALR decision making process.

1. Has a risk assessment been conducted for each pest of concern that is associated with the proposed import? If not, then ALR cannot be addressed, because many of the following questions cannot be answered due to insufficient information.

Question 2 provides information about **host identification and pest establishment**.

2. Based on the risk assessment, what is the likelihood that the pest will gain entry and become established on at least one host plant species in the United States? This quantitative or qualitative estimate is derived from the biological analysis conducted for the risk assessment. The possible range of any quantitative estimate and source of uncertainty should be stated as clearly as possible.

Questions 3 through 7 require decision makers to consider the **general economic and/or ecological importance** of potential hosts in this country.

3. How many plant species will the pest infest? A pest with a wide host range may pose a greater threat than one that infests only a few species. A comprehensive list of agricultural or forestry crop species that can serve as hosts should be part of the biological analysis in the risk assessment. Uncertainties regarding the host range should be noted.

4. Is any of the pest's hosts an agricultural crop (includes tree species in managed forests)?

5. Do any of the pest's hosts occur naturally in nonmanaged ecosystems?

6. Are any of the pest's potential hosts in this country currently listed as threatened or endangered?

7. Are any of the pest's potential hosts in this country considered keystone species in their community?

Questions 8 through 10 direct decision makers to consider the **economic value of any commercial plant resources** at risk from the pest.

8. For those potential hosts that are grown commercially, what is the total value of these potential agriculture/forestry hosts to all sectors of the national economy?

9. For each agricultural host, what would be the aggregate economic cost to all sectors if the pest became established (i.e., cost to the entire nation)?

10. Based on the total economic value of the host (i.e., based on all sectors of agribusiness that deal with that crop), what proportion of that value could be expected to be lost due to pest introduction? These questions

address the total magnitude of the costs and the importance of those costs in the overall economics of the crops that stand to be impacted by the exotic pest.

Questions 11 through 17 address the **distribution of economic costs** of pest establishment in agroecosystems or commercial forests.

11. How are the host species distributed in the United States? Uneven distribution suggests that a particular sector of the economy, such as agriculture, a region, or a segment of society will be affected more than others.

12. Given the range of varieties used and the variability of climate across the range of the crop species, are some producers assuming more of the risk than others?

13. Are any of the host species located near the port of entry or along major routes of transportation over which the import will be moved?

14. Nationally, what proportion of producers are likely to be impacted by the pest if it becomes established?

15. What proportion of U.S. consumers would be affected by an increase in consumer prices attributable to the pest?

16. Would a pest-related increase in consumer prices be borne more by a particular group of consumers than by another?

17. Even if the pest-related economic risk to U.S. consumers is low, would infestation of a U.S. crop reduce its value to producers for export markets?

Questions 18 through 26 asks decision makers to consider **the level and distribution of risks posed by the pest to non-agricultural plant resources**.

18. Could any non-cultivated host species represent a refuge or reservoir for the pest, even after the pest was eradicated from cultivated plants?

19. How often could reinfestation of agricultural or forestry crops be expected to occur if the pest became established in a population refuge or reservoir hosts?

20. What would be required, and what would the costs be, to eradicate the pest once it became established in a non-managed ecosystem?

21. Could establishment of the pest in a non-managed ecosystem result in loss of value of the ecosystem for parkland, campground, hunting, fishing, or other recreational use?

22. Could establishment of the pest in a non-managed ecosystem result in loss of wildlife food or habitat?

23. If the pest suppressed the population of a plant species in a particular location, could other plant species become weed problems as they are "released" by elimination of competition?

24. Is it possible to estimate the economic costs to society for the impact of the pest on non-cultivated plants, and if so, what is that estimate (and how reliable is it)?

25. Would costs (economic or otherwise) of infestation of non-cultivated plants be borne more by one segment of society than another?

26. What proportion of the public would bear the costs of the pest's impact on non-cultivated plants (e.g., those who obtain a significant portion of their food from hunting or fishing, those who are regular users of national parks that are impacted by the pest)?

Other benefits from the question-and-answer approach to ALR. Although this protocol addresses primarily Member obligations for consistency and transparency for phytosanitary regulations under the SPS Agreement, it could contribute to several other objectives of the Agreement as well. Under Article 3 (Harmonization), Members are instructed to base their SPS measures on international standards, guidelines or recommendations, and to promote within the International Plant Protection Convention "the development and periodic review of standards, guidelines and recommendations with respect to all aspects of [SPS measures]." A standardized set of questions for driving the judgment of risk acceptability adopted by all Members may contribute to harmonization of the risk judgment process. Furthermore, Members could agree to allow the use of additional questions to address specific

concerns. A specific question might reflect the Member's desire to "introduce or maintain [SPS measures] which result in a higher level of sanitary or phytosanitary protection than would be achieved by measures based on the relevant international standards, guidelines, or recommendations" (Article 3.3) (in this case, the internationally accepted set of questions). Such additional questions would require scientific justification and communication to other Members (Article 7, Annex B). Article 11 (Consultations and Dispute Settlement) states that "[i]n a dispute under this Agreement involving scientific or technical issues, a panel should seek advice from experts" in the settlement process. Thorough documentation of the risk assessment and ALR decision process would provide a basis for an expert panel's evaluation of the challenge and defense of the disputed import decision. Such documentation could include the relevant risk assessment; documented answers to the importing Member's set of questions (internationally standardized set plus any predisclosed additional questions); explicit statements of judgments on the acceptability or unacceptability of the issue raised by each answer; documented sources of information for declaring each issue acceptable or unacceptable; and perhaps most important with respect to consistency in ALR decision making, reference to answers and issues when the questions were applied in previous import decisions.

Comments on this article can be e-mailed to Steven Shafer (sshafer@oce.usda.gov) or sent to him at ORACBA. Comments will be compiled and forwarded to the PPQ Management Team.

[1] Readers should refer to the excellent article written by John Greifer (USDA-APHIS) in the January-February 1998 *ORACBA News* for a detailed discussion on ALP as it appears in the SPS Agreement.

Director's Corner by Nell Ahl

USDA/ORACBA Courses And Curriculum Project: A Partnership With FDA's JIFSAN

Soon after ORACBA was formed, the need for a course on the basics of risk assessment was recognized. Two courses, a primer on risk assessment and an advanced course, were piloted in the summer of 1996. In a collegial spirit, FDA and EPA analysts were invited to participate in evaluating the courses. Resulting from this activity, a partnership between USDA and FDA was formed to develop further training opportunities in risk analysis. Based on positive responses to the 1996 courses, USDA and FDA persuaded the Graduate School USDA (formerly the USDA Graduate School) to of fer the course, Introduction to Risk Assessment. Over 100 individuals have taken the course in the past 18 months. Participants have continued to ask about other courses, so Richard Williams (FDA) and Nell Ahl (USDA) developed a draft curriculum. It was a fine dream, but it lacked the resources to develop and pilot the courses for the curriculum.

The President's Food Safety Initiative came into being (1998) and the Joint Institute for Food Safety and Applied Nutrition (JIFSAN) was created as an alliance between the University of Maryland and the FDA, Center for Food Safety and Applied Nutrition (CFSAN). JIFSAN selected the Curriculum in Risk Analysis as a project to support. With resources for developing and implementing the courses, the curriculum is now a step closer to realization. The Graduate School USDA will make these courses available, and in addition, will of fer a Certificate in Risk Analysis.[1] JIFSAN will offer these courses through the University of Maryland; the course materials will be available to any who wish to use them. The Risk Analysis Curriculum is presented here:

1. Risk Analysis for Managers. This course provides an introduction to risk analysis and the broad concepts which underlie regulatory development in a risk-based context. [Planned for one-half day; pilot of fered early Q2, FY99]

2. Introduction to Risk Analysis. (Formerly known as Introduction to Risk Assessment) This course provides a brief introduction to risk analysis, with emphasis on general methods of risk assessment. Examples are primarily for biological agent risk assessment, for human health (food safety) and for animal and plant health related to international trade. [4 days]

3. Economics for Non-Economists. For non-economists, this course offers a basic understanding of how risk assessment and cost-benefit analysis are used in decision making; also discussed is the role of cost-effectiveness. [Planned for 3 days]

4. Risk Communication. The influence of risk perception and risk communication on risk management and risk assessment is considered; the role of risk communication for government regulators is stressed. [Planned for 3 days]

5. Exposure/Dose-Response Assessment. The National Academy of Sciences (1983) defined the "Red Book" paradigm for human health and environmental risk assessment. The application of these ideas to food safety and other issues is discussed. [Planned for 3-4 days]

6. Ecological and Environmental Risk Assessment. This offers an overview of qualitative and quantitative methods for risk assessment for biotic (microbial and other replicating organisms) and abiotic (chemicals, pesticides and physical changes to the ecosystem) stressors or hazards. Case studies will illustrate individual and multiple stressors; links between human health and ecological endpoints will be explored. [4 days; pilot offered January, 1999]

7. Introduction to Quantitative Assessment. The application of PRA to biological risk issues is developed. Training includes scoping the risk assessment, development of scenarios, choice of distributions, discussion of Monte Carlo simulation, and interpretation of assessments. Computer activities will provide beginning training in use of @Risk® (Palisade Corporation, Newfield, NY). [Planned for 3-4 days]

8. Advanced Quantitative Risk Assessment. This course is designed for individuals with quantitative interests and skills, and experience in using spreadsheets such as Excel® (Microsoft Corporation, Redmond, WA). Participants learn modeling techniques based on @Risk® software. The separation of uncertainty and variability is emphasized. Classical as well as Bayesian statistics are discussed. [2 weeks]

9. International Risk Analysis Issues. This will cover the essentials of the sanitary and phytosanitary agreements including requirements for risk analysis, effects on international trade and structure of organizational ruling and risk analysis bodies. [Planned for 2 days]

10. Special Topics in Risk Assessment. This experience is designed for individuals who are actively engaging in quantitative risk assessment as part of their daily work and who have taken the Advanced Quantitative Risk Assessment (#8). The course is organized when senior risk assessors request specialized consultation with expert practicing risk assessors. [1 week]

[1] To earn a Certificate in Risk Analysis through the Graduate School USDA, an individual must participate in five of the courses shown here. The Introduction to Risk Analysis or its equivalent is a prerequisite for other courses. Course 1, Risk Analysis for Managers, does not give credit for the Certificate program. Call Dr. Al Officer [202/314-3432] for information on course dates

USDA Risk Assessor in Profile

Dr. Ronaldo A. Sequeira

Dr. Ronaldo A. Sequeira is a Biological Scientist with the new USDA-APHIS Center for Plant Health Science and Technology (CPHST) located at North Carolina State University in Raleigh. As one of the scientists on the original CPHST start-up team organized last year, Ron is part of a multidisciplinary staff that provides leadership for APHIS in strategic applications of pest risk assessment/management, plant and insect modeling, area-wide pest management, and spatial analysis for agricultural quarantine and inspection.

Ron received his M.S. in Entomology and his Ph.D. in Bioengineering and Industrial Engineering at Texas A&M. During his research career at Texas A&M and USDA-ARS (1990-97), Ron authored publications on crop simulation models, automation of model parameterization, computational approaches to studying ecosystem dynamics, and automated decision-support systems.

Ron's expertise in modeling and computers has given him opportunity at CPHST to be involved with operations dealing with two of the most controversial plant pests that APHIS must face, Mediterranean fruit fly (Medfly) and Karnal bunt of wheat. With new Medfly outbreaks in the Tampa, Florida, area last year, APHIS emergency operations were activated to manage the pest. Malathion spraying from aircraft over urban and agricultural areas was scrutinized closely by local government, community groups, and the press. A critical requirement of the operation was to avoid application of the insecticide over open bodies of water. Ron designed a computer-driven system that used Global Positioning System (GPS) to activate and deactivate the sprayers on the aircraft to ensure that the insecticide was applied only where it was permitted. In his "spare time" during this assignment, Ron used a Geographic Information Systems (GIS) approach to study the spatial distribution and spread of specially marked sterile flies released as part of the Medfly management operation. This information helped pest risk managers relate numbers of flies found in traps to estimated populations in the field, and also understand the rate and direction of Medfly dispersal.

Ron also has applied his abilities to a national-scale risk assessment for Karnal bunt of wheat. He began with the idea that the probabilities of infection, colonization, and spread of this pathogenic fungus, once introduced into the United States, are based on the epidemiological principle that plant disease develops only when a susceptible host and a virulent pathogen occur together in an environment conducive for their interaction. Ron assessed the likelihood of Karnal bunt occurrence by layering a critical environmental factor (temperature, obtained from 30 years of weather data at a county and sub-county level for the 48 contiguous states) and crop development forecast information as GIS mapping layers. Based on the likelihood of coincident host susceptibility and conducive temperatures, Ron's GIS-based risk assessment led to the conclusion that wheat grown in the great majority of U.S. production regions is at low risk from Karnal bunt.

Ron believes that such uses of GIS-based information offer many applications in risk assessments and management for pests and other spatially distributed hazards in the environment. He will be continuing this work, as well as coordinating workshops on GIS applications for APHIS employees, as part of his assignment to address strategic issues in emergency programs, pest risk identification, risk assessment, and risk management at the APHIS Center for Plant Health Science and Technology. Ron will speak on this interesting area of research at the October ORACBA Risk Forum.

July Risk Forum:

Panelists from three USDA agencies made brief presentations and led discussion on the topic of "Ecological Risk Assessment and the National Environmental Policy Act (NEPA) Process: Comparison and Uses in Federal Rulemaking." Andree Du Varney (NRCS), Jack Edmondson (APHIS), and Rhey Solomon (Forest Service) discussed differences and similarities among documents written to meet NEPA requirements, and how risk assessments could inform NEPA documents and vice-versa. For example, the ecological risk assessment conducted by NRCS, the NRCS planning process, and the Environmental Assessment required by NEPA to support the final rule for the Environmental Quality Incentives Program (EQIP) required similar, related analyses that could be improved if there were a more integrated approach. In another example, an Environmental Impact Statement (EIS) related to gypsy moth management in 1984 was based on a comparison of seven pesticides under consideration; in the early-1990s, a subsequent EIS for gypsy moth management involved a risk assessment to meet NEPA requirements to evaluate the best information available in comparing risks associated with one pesticide to risks from several non-chemical options. Challenges associated with all these analyses can involve making them relevant to national spatial scales, assessing impacts on human health versus the environment, finding ways of quantifying uncertainties in the analyses, and preparing the documents with language that is understandable to stakeholders.

September Risk Forum:

Dr. James D. Wilson raised the question, " Do we need to understand the relationship between how much of some harmful agent is taken in and the chance of getting sick?" He maintained that it all depends. In FDA, those who regulate contaminants in food do need to balance competing values and need an assessment of the consequence of one or more alternative approaches. Those who regulate permitted additives, however, get by with estimates of what intake is safe, something near the largest intake that will not cause harm. An assessment of the consequences is not needed for a single valued--is it safe--safety analysis. The difference between these two types of decisions can be profound, both legally and experimentally. Of interest now is what similar information will be useful for regulating numbers of microbiological agents in food. Present regulations rely on estimates of what levels can be considered safe; it appears that the transition to HACCP will not change this approach. If so, knowing what is dangerous will not be important, and a focus on dose-response may be misplaced. On the other hand, if world trade considerations require that policies be justified by cost-benefit analyses, dose-response information will be required.

Risk Resources

The first item in this section addresses public interest in transmissable spongiform encephalopathies (TSEs) and in particular bovine spongiform encephalopathy (BSE) by providing website addresses on these and related topics. The second item describes Aquatox, an ecosystem model developed by EPA.

Website	Comments
www.yahoo.com	The list forms a fairly comprehensive index of available resources on the Web. Good place to search for TSE sites.
www.usda.gov	Both the FSIS and the APHIS have home pages that discuss BSE and TSEs.
www.cdc.gov	Centers for Disease Control website. Good place to search for TSE sites. Search for "bse, tse" leads to a long listing of related sites.
W3.aces.uiuc.edu/AnSci/BSE	The University of Illinois, Champaign-Urbana site for the College of Agriculture and School of Veterinary Medicine. Major focus on animal health.
www.cs.umd.edu/projects/plus/SHOE/tse	The JIFSAN site will serve (when completed) as a clearinghouse on information about TSE's.
www.OIE.int/Info/A_info.htm	This Office of International Epizooties site is concerned with animal health.
www.uoguelph.ca/~dpowell/today.htm#Agnet	University of Guelph supports this animal health site.
www.easynet.co.uk/ifst/hottop5.htm	The Institute for Food Safety and Technology (IFST) is the qualifying body for food scientists and technologists in the UK. The primary

Website	Comments
	interest is food safety and human health.
www.maff.gov.uk	The site includes policy and history of the BSE challenge in the UK as well as current events.
www.cjd.ed.ac.uk	British site for Creutzfeld-Jacob Disease (CJD), new variant CJD and related human diseases.

Aquatox

Aquatox, an ecosystem model developed by U.S. Environmental Protection Agency, allows ecological risk assessors to analyze the combined effects of multiple stressors such as nutrients, sediments and toxic chemicals in aquatic ecosystems. The model predicts the fate of chemical toxicants in the aquatic system through hydrolysis, photolysis, microbial degradation, volatilization, ionization and partitioning among organisms, suspended and sedimented detritus, suspended and sedimented inorganic sediments and water. The types of effects predicted by the model include acute toxicological responses, as well as indirect effects such as changes in predation or grazing pressure, increase in detritus and recycling of nutrients from killed organisms, changes in dissolved oxygen and loss of food base for certain groups of organisms.

Aquatox integrates data on chemical stressors and site-specific data supplied by the user with ecological data to provide risk assessments in a wide variety of aquatic ecosystems such as streams, ponds, lakes or reservoirs. Data on a number of chemicals and aquatic organisms are already included in the Aquatox database. The model considers several trophic levels including attached and planktonic algae, submerged macrophytes, benthic and planktonic invertebrates and several different functional groups of fish. Probabilistic risk estimates can be generated through a Monte Carlo simulator incorporated into Aquatox. The model is designed for IBM-compatible computers running Microsoft Windows 95 or Windows NT operating systems. Aquatox is distributed through the EPA's Office of Water Programs and the Office of Pollution Prevention and Toxics (OPPT). For further information contact David Mauriello (OPPT) via Email at mauriello.dave@epa.gov or Marjorie Coombs Wellman (Office of Water) at wellman.marjorie@epa.gov.

Risk Calendar

October 1998

The ORACBA Risk Forum will be Wednesday, October 14, from 10 to 11:30 a.m. in the Whitten Building, 107-A. Dr. Ron Sequeira will present "Integrating Spatial Analysis and GIS into Regulatory Risk Assessment: The Case of Karnal Bunt." For more information, please call (202) 720-8022.

The American Law Institute - American Bar Association, the Environmental Law Institute, and the Society for Risk Analysis are co-sponsors of the course "Risk Assessment and Risk Management in Environmental Law" on October 8-9 in Washington, DC. For more information, contact ALI-ABA at (215) 243-1630 or visit their website at: http://www.ali-aba.org.

The International Life Sciences Institute has organized a conference "National Food Safety Initiative: Implications for Microbial Data Collection, Analysis, and Application" which will be held October 14-16 in Arlington, VA. For further information, contact Catherine Nnoka at (202) 659-0074, FAX (202) 659-3859, or E-mail: cnnoka@ilsi.org.

On October 16-18, The Johns Hopkins School of Public Health, Environmental Systems Research Institute, and World Computer Graphics foundation are sponsoring the First International Health Geographics Conference in Baltimore, MD. The purpose of this conference is to comprehensively bring together for the first time people from many different disciplines who share a common foundation: the geographic aspects of health. For further information, contact Omar A. Khan at (410) 659-6149 or at E-mail: okhan@jhuccp.org.

The University of Massachusetts-Amherst is sponsoring their 14th Annual Conference on Contaminated Soils on October 19-22 in Amherst, MA. Further information is available at (413) 545-1239 or at E-mail: dleonard@schoolph.umass.edu.

The Food Safety and Inspection Service is sponsoring a public meeting on their risk assessment for *E. coli* O157:H7 in beef and ground beef. The meeting will take place October 28 in Arlington, VA. The purpose of this meeting is to solicit from the public scientific information that would be relevant to conducting the risk assessment. For further information, contact Traci Phebus at (202) 501-7138 or FAX (202) 501-7642.

November 1998

The National Ground Water Association is sponsoring a conference "1998 NGWA Animal Feeding Operations and Ground Water: Issues, Impacts, and Solutions" November 4-5 in St. Louis, MO. The USDA Agricultural Research Service is one of the co-sponsors of this meeting. The keynote speaker will be Senator Tom Harkin (D-Iowa). For further information contact NGWA at (614) 898-7791 or FAX (614) 898-7786 or visit their website at: http://www.ngwa.org.

On November 9-10, the Society for Risk Analysis is sponsoring a workshop titled "Wrangling Variability and Uncertainty: How Risk Analysis Draws Quantitative Conclusions from Sparse, Incomplete and Qualitative Information" at Crystal City, VA. For further information, contact Scott Ferson at Email: scott@ramas.com or call (516) 751-4350. You may get more information at the SRA website: http://www.sra.org.

The ORACBA Risk Forum will be Wednesday, November 17, from 10:30am-12:00 p.m. in the Whitten Building, 107-A. Dr. Tom Oscar will present "The Food Animal Risk Model for Poultry Pathogens." For more information, please call (202) 720-8022.

The Society of Environmental Toxicology and Chemistry (SETAC) will be holding their 19th Annual Meeting on November 15-19, in Charlotte, NC. For more information, contact SETAC at (850) 469-1500, E-mail: setac@setac.org, or at URL: http://www.setac.org.

December 1998

The Annual Meeting for the Society for Risk Analysis will be held December 6-9, in Phoenix, AZ. For more information, contact SRA at (703) 790-1745, sra@burkinc.com, or at URL: http://www.sra.org.

There will not be a Risk Forum this month because of our participation in the Society for Risk Analysis meetings. Come join us in Phoenix or join us again at the January Risk Forum.

January 1999

The Risk Forum will be Wednesday, January 13, from 10 to 11:30 a.m. in the Whitten Building, 107-A. A panel will discuss "Wildlife Habitat Implications of Alternative Conservation Reserve Program Management Practices: an Application of Adaptive Risk Information Analysis." For information, please call us at (202) 720-8022 later this year.

The **ORACBA** Newsletter reports risk analysis activities in the U.S. Department of Agriculture, upcoming meetings and events, and other activities supporting the development and use of risk assessment in USDA. This quarterly newsletter is available at no charge to risk assessment professionals in USDA. Send comments or address changes to: USDA, ORACBA, Room 5248-S, Mail Stop 3811, 1400 Independence Avenue, SW, Washington, D.C. 20250-3811. Call (202) 720-8022, or fax (202) 720-1815.